

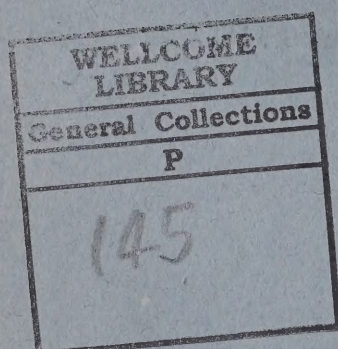
MEDICAL ADVISORY COMMITTEE

MESOPOTAMIA INQUIRIES

Report on 3rd Indian Army Corps

October 1916





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CONFIDENTIAL

MEDICAL ADVISORY COMMITTEE.

MESOPOTAMIA INQUIRIES.

Report on health conditions in the advanced area (Corps).

October 1916.

To

SURGEON GENERAL F. H. TREHERNE, C.M.G.,

Director, Medical Services, Mesopotamia Force.

SIR,

The Committee arrived at Corps Headquarters from Sheik Saad on October 11th and on subsequent days were engaged on inspections, the chief of which are noted on the programme attached below (No 1). Save as regards the inspection of the Sannaiyet trenches on October 15th, Lieutenant-Colonel Ledingham did not form one of the inspecting party but devoted himself to bacteriological work with Major Gloster, I.M.S., on the laboratory barge at Arab Village. He was joined there on October 21st by Lieutenant-Colonel Wenyon, who carried out a short series of protozoological investigations on the stools of patients sent in for examination and prosecuted some enquiries as regards dysentery in the Field Ambulance of the 7th Division. The results of the laboratory work conducted by these members of the Committee are referred to in paragraphs, 86—91.

1. GENERAL CONSIDERATIONS.

1. The area occupied by the three divisions at present comprised in the corps is of very considerable extent, and the various units are scattered over a large tract of country. This specially true as regards the 14th Division in the Ess Sinn portion of the area. The 7th Division occupies the Sannaiyet trenches and the region behind them on the left bank of the Tigris, part of which is situated between that river and the Suwaikieh Lake. The supply depôt of this division, together with the Cavalry Brigade and its ambulances, are on the right bank of the Tigris at Arab Village. The rest of the force is also to the south of, or on the right bank of, the Tigris. With the exception of its 8th Brigade which is at Sinn Abtar near Ess Sinn and of its depôt and rest camp at Sheikh Saad, the 3rd Division is grouped about The Narrows, Highland Nullah and Twin Canals. As stated, the 14th Division is scattered about the Ess Sinn area holding the advance posts of Dujailah, Imam-el-Mansour and the Pentagon and stretching from the Tigris on the north-west to the Dujailah redoubt and the line of strong posts guarding, in the south-east, the military railway which runs from Sheikh Saad to Ess Sinn and is being continued.

2. The Corps has as its Deputy Director, Medical Services, Colonel Starr, and for purposes of sanitary administration its Deputy Assistant Director, Medical Services, is Major J. D. Graham, I.M.S., whose work in the Suez Canal area in Egypt very favourably impressed the Committee. Each of the three divisions now has its own sanitary section on the new Indian basis with its separate British sanitary officer. In this connection we append (No. 2) a diagram showing the organization of No. XI Sanitary Section of the 3rd Division which is in charge of Lieutenant H. H. Brown, I.M.S., and whose scheme serves to indicate not only the personnel but its distribution. As this division was found to be in a satisfactory state of sanitary efficiency the scheme shown is likely to prove a useful guide.

3. We may say at once that the sanitation of the whole area occupied by the Corps left little to be desired at the dates of our visits, and that there was evidence of much recent improvement which had followed a series of surveys and reports made by the Deputy Assistant Director, Medical Services (Sanitary),

of the Corps some weeks previously. That of the 7th and 3rd Divisions was particularly good. The 14th Division lagged somewhat behind, but was found to be rapidly making up leeway. In some respects it occupies the most difficult of the three positions. Until the completion of the railway it was isolated, its area is extensive and has in many parts a very irregular surface owing to the presence of the Sinn Abtar mounds, the Tel Hills, etc., and the numerous nullahs, depressions and old Turkish defences which traverse it in many directions. Of the latter the Dujailah depression which is probably an old channel of the Tigris is a notable example. This Ess Sinn area is also liable to very trying dust storms, the tamerisk and other scrub having in most places either been worn away by constant traffic, or used to supplement deficiencies in fuel.

It was found that for the Corps as a whole Major Graham, in consultation with the medical officers of the divisions, had evolved an excellent general scheme of sanitation, well organised, well understood, sufficiently elastic to cope with such difficulties as might arise and yet sufficiently defined to prevent confusion and overlapping. Full records on sanitary matters were available from the time this officer had taken up his duties and careful attention had been paid to those details on which so much depends. Questions raised by the Committee were promptly and satisfactorily answered and it was evident that the officer in charge had a very complete grasp of the whole situation, and further, that, when necessary, he did not hesitate to take strong and immediate action in which we are glad to note he received official support and encouragement from the Deputy Director, Medical Services, and the Corps Commander. In addition to such a satisfactory state of things at Headquarters, the Committee was also glad to find that the sanitary officers of the several divisions were keen and energetic. In more than one instance they were impressed by the skill shown in improvisation of material and in surmounting difficulties and, all things considered, they are of opinion that those responsible for the sanitation of the Corps Area are deserving of much credit for the manner in which, despite many drawbacks, they have grappled with a difficult situation and evolved a sound and efficient system with a minimum of material and a changing personnel. The importance of not disturbing a sanitary organization which is working so smoothly and efficiently is referred to below (paragraph 50). It will be convenient to consider the future needs of the Corps Area when discussing various questions in some little detail beginning with:—

2. WATER SUPPLY.

4. So far as drinking water is concerned, with the exception of a few shallow wells in certain parts of the area occupied by the 14th Division, the supply is derived from the Tigris. In the case of the 7th Division, both within and outside the trench area, the water stations are situated on the river bank and consist of small force pumps worked by hand which lift water through hoses to tarpaulin-lined tanks dug out of the soil and, where necessary, strengthened by sand bags, and covered over, as far as material allows, by other tarpaulins. Chlorination with bleaching powder is done on the spot either before or after precipitation by alum. We may here state that, as a result of our inspections and enquiries, we are of opinion that the precipitation should precede chlorination, as in this way a clearer and better water is obtained. Whenever practicable two tanks should be used, one for precipitation and the other for chlorination. When distribution to any distance is required it is usually effected in pakhals carried either in carts or by animals. The Committee were specially struck by the good arrangements made for the collection and purification of water supplied to the various sections of the Sannaiyet trench area where, naturally, the work presents special difficulties. At the present season the river is low and its water comparatively clear and free from suspended matter. Hence only a small quantity of alum, about 2 grains per gallon is required for efficient clarification and sedimentation. The process will require very considerable modification when the river is laden with silt. Unit chlorination is at present the system relied upon in the 7th Division but this is to be altered and the water treatment will be undertaken by brigades, a change doubtless making for greater efficiency.

5. On right bank of the river the same simple process of collection, storage, treatment and transport is in vogue for the Cavalry Brigade area and Corps Headquarters, but for the supply of most of the camps of the 3rd and 14th Divisions which are situated at considerable and varying distances from the Tigris, a different scheme is in operation. Oil-driven pumps have been erected at four separate stations on the river banks, *i.e.*, Thorny Nullah, Abu Roman, Nasifiyeh and Megasis and these raise the water to small open cuts, running either above or below soil level which convey the water to Highland Nullah (including Twin Canals), the Narrows, and two different portions of the Ess Sinn area, respectively.

In the case of the Thorny Nullah and Abu Roman supplies the water is treated and rendered safe at spots near its ultimate destination, there being, in the case of the Thorny Nullah supply, two separate chlorinating stations, one close to Highland Nullah Camp and one close to the Twin Canals. The Abu Roman supply is similarly dealt with in proximity to the 3rd Division camps at the Narrows. In the case of the Nasifiyeh and Megasis supplies the chlorinating stations are not far from the intake, and in the case of the latter have to be protected from Turkish snipers. The pumping stations themselves are at present still more exposed to enemy shells and bullets.

6. We understand that if the scheme to take a piped supply along the line of railway from Sheikh Saad to Ess Sinn comes into operation, the Thorny Nullah and Abu Roman installations will cease to be necessary, as Twin Canals, Highland Nullah and the Narrows will be reached by pipe from the main line. The Nasifiyeh and Megasis supplies must, however, persist in any case and hence it is necessary to say a few words regarding this system of supply by open channels which cannot be considered satisfactory albeit rendered necessary as a temporary measure by military exigencies.

7. The open cuts to which reference has been made are liable to become overgrown by grass and afford breeding places for mosquitoes. If raised above soil level their banks tend to leak and the resulting seepage pools are also apt to become mosquito nurseries.

Even with the most careful policing, opportunities for fouling are not lacking and water carriage by such a method is liable to interference by heavy rains and flooding. Hence it is very desirable that these open channels should be replaced by proper water pipes—a proposal made, and we believe officially agreed to, at least five months ago. There has been great and very regrettable delay in the provision of the pipes ordered for the purpose and for the main Sheikh Saad to Sinn supply and every effort should be made to facilitate their delivery. (See minute from the Committee to Director of Medical Services, October 29th 1916.) We are informed that steps have recently been taken to expedite their arrival. The pipe-layers have reached the Base.

At the chlorinating stations two different methods were in operation, bleaching powder being used in some places while at others, the Nelson-Treherne process was employed, nascent chlorine being generated from potassium chlorate by HCl and utilised for the production of chlorine water which was added to the water in the tanks. The latter method, when properly carried out, is excellent but at the present time potassium chlorate is both expensive and difficult to obtain, and, small though the apparatus is, the process is not so simple as the bleaching powder method. If the vulcanite bottle stoppers recommended by Captain Harper Nelson are not available recourse must be had to cork or rubber, and both tend rapidly to deteriorate and spoil the exactness of the method. There is a lack of reserve supply of corks, glass and rubber tubing, etc., which should at once be rectified where the apparatus is in use. Where, however, the apparatus was in good order, as at the Highland Nullah station, the chlorination was being performed in a very satisfactory manner. Here Captain Reinhold, Deputy Assistant Director of Medical Services, 3rd Division, had instituted a war diary for the water work. It was being carefully kept up to date by the corporal in charge and furnished a very useful record. We think this scheme might with advantage be copied at other central chlorinating stations.

8. The best type of tank has a depression at one end which acts as a well and facilitates the withdrawal of water whether by pump or siphon. The

tendency of the tarpaulins to rot and split was noted. The average life of one of these tarpaulins, when in constant use, appears to be about six weeks. There is much need in the area for canvas repairers and it is hoped that the large rubber canvasses, of which we had information at Basrah, may soon arrive as we understand they are more durable and better fitted for the purpose of water storage.

9. Enquiry as regards the small hand pumps of the type now in use show that they are apt to be damaged by improper handling, a short jerky stroke while pumping tending to throw them speedily out of action. As a result they accumulate at the engineers' camps awaiting repairs, and much inconvenience result from their absence from the water stations. It might be well to set enquiries afoot with a view to finding a stronger and more useful form of hand pump.

10. A good supply of hose pipe both for present use and for spares is essential, and it should be of the best quality. Red rubber tubing for siphoning from the smaller tank supplies is also very necessary.

11. The distribution of the treated water from the stations to the various camps is not too satisfactory, there being a great deal of man-handling. Every available method of transport is employed—mules, motor lorries and carts carrying fantasses, pakhals (often without their screw stoppers) and other receptacles; also carts fitted with tarpaulin tanks. In some camps, a secondary local chlorination is carried out as an extra preventive measure.

12. The 8th Brigade of the 3rd Division is at present a long way from the nearest chlorinating station and, as transport is limited, a certain amount of unchlorinated water from the Nasifiyeh cut is brought into the camps of the brigade for washing purposes. We were assured that this water is not used for drinking and that no ill effects had been noticed from its presence. It seems necessary to permit its use under existing conditions. In the case of all the canals the cut is continued beyond the chlorinating stations and the raw water thus obtained utilised for ablution and for watering animals. A further extension of the Megasis cut for these purposes is under consideration and if carried into effect will supply plenty of raw water to Sinn Abtar Camp. As, however, this extension would pass through soil which has been very heavily fouled it would be better, in the absence of piping, that the Sinn Abtar Camp should rely, as at present, for drinking water on the water treated at the Nasifiyeh station even though the latter is at a considerable distance.

13. The average daily supply varies from $1\frac{1}{2}$ to $2\frac{1}{2}$ gallons per man and no complaints were made as regards actual shortage. The water is usually cooled in Persian hubs or diggies and the jolting during transport appears effectually to dispel all taste of chlorine. The new type of diggie issued by the Engineer, Base Park, Basrah, has in most instances proved disappointing. It leaks badly at first and continues to leak so that much water is lost. Its stand is clumsy and heavy and there is wastage in the iron bars on which it is suspended. It should be replaced, if at all possible, by the smaller and neater pattern used privately by Indian units. The latter has Willesden canvas and is provided with a frame platform on which the weight of the heavy water bag is borne to some extent.

14. The shallow wells already mentioned (paragraph 4) are practically confined to the line of the Dujailah depression and furnish a supply to the garrisons of the Dujailah and Imam-el-Mansour redoubts. The few wells tried elsewhere have very soon given only a brackish or bitter water unfit for drinking. The best of these wells are lined by timber and corrugated iron sheeting and yield a good, cool, sweet water. The level of one at Dujailah is about 16 feet below the surface of the depression and at the time of our visit there was about 5 feet of water in the wells. At Dujailah the supply was $1\frac{1}{2}$ gallons per man for all purposes except washing. The water is chlorinated in the redoubts by the bleaching powder method. There is need for reserve pumps and hose. From one of the wells water was being drawn by a petrol can slung on a rope.

We are informed that, contrary to what might be expected in such a situation, the winter rains are not likely to lead to flooding and interference

with these supplies but it must be admitted that they are not very satisfactory for the total yield is scanty and it is possible that the sweet wells may become brackish.

15. It seems to us that this is a region where deep boring might be tried with advantage. If successful, water-supplies would be secured, free to a large extent from molestation by the Turks and capable of being utilised for irrigation purposes with a view to the establishment of vegetable gardens which would be of great use for the prevention of scurvy.

16 The strong points on the railway are supplied daily by chlorinated water brought by train from Sheikh Saad and this system appears to work satisfactorily. It will be replaced by a standpipe supply from the main pipe line when the latter comes into being.

3.—ABLUTION.

17. Save where camps are in close proximity to the river, as in the case of the 7th Division, the Cavalry Brigade, Corps Headquarters, etc., the arrangements for washing are necessarily both primitive and limited. The canal extensions to which reference has just been made have helped matters very considerably, and in the case of the 3rd Division we noticed a very ingenious type of shower bath constructed of petrol cans, mud and *bhusa* bands. There is undoubtedly room for development in this direction elsewhere but if anything is to be done on a larger scale, *e.g.*, for camps in continued occupation during the colder months material must be forthcoming in the shape of wood, canvas, piping, Persian heaters, etc. The Deputy Director, Medical Services, informs us that he is making an arrangement for obtaining for British units small supplies of hot water from the camp incinerators. This should serve to economize fuel in some measure.

18. We would draw special attention to the paucity of the soap ration. The official issue is only 2 ozs. per man per week and this is not reaching the troops at all points. As Tigris water is hard it soon vanishes. The ration allotted and supplied should certainly be increased both for British and Indian troops.

4.—DISINFECTION.

19. The question of ablution leads us to the consideration of the facilities for disinfection in the Corps Area. These have not been lost sight of by the Sanitary authorities but they can scarcely be described as adequate having in view the development of lousiness in the cold season and the possible occurrence of scabies and of outbreaks of typhus or relapsing fever.

A central disinfection station exists at Arab Village and contains three of the ordinary thresh machines. One of these could at any time be detached for service in the Ess Sinn area. We understand that more of the small Newman disinfectors, one of which we saw at Highland Nullah, will ere long be available. These, however, have a very limited capacity. It is also intended to make use of cresol solution in tubs for the disinfection of clothing but unfortunately the supply of cresol available appears to be low. In many places the lack of fuel puts Serbian barrels out of account and hence there can be no doubt that a supply of portable Clayton disinfectors would be most useful. We have already suggested, in our minute to the Director of Medical Services of October 29th, that six of these should be obtained from England in addition to those already supplied. These disinfectors could either be distributed to the divisions or utilised at Sheikh Saad or some other convenient place at the head of lines of communication. A disinfecting station was being arranged for at Sheikh Saad at the date of our visit there, and on present information we think there might be much advantage in extending this station into a place where clothing could be washed and mended, and a good system of hot baths established. This enlarged disinfecting station would be available for men coming into or going away from the area, and for troops or drafts in rest camps.

For portable means of disinfection on a larger scale it may be possible to improvise some kind of railway disinfecting van or tank somewhat on the lines

of those introduced into Egypt and which proved so valuable in the Suez Canal area. A river barge, if available, might also with advantage be fitted up as a portable disinfectant.

20. The supplies of cresol and chlorinated lime had, in nearly every portion of the Corps Area come to an end. It is very important that deficiencies in this direction should be made good and an ample supply of these necessities be assured. Very wisely the disinfectant supply for the area has been limited to cresol, lime and crude oil with a flash point of 125°. This limitation should facilitate supply and we trust that every effort will be made to avoid shortage in the future.

5.—CAMP AND CAMP SITES.

21. We were glad to find that over the greater part of the area occupied by the Corps there is a definite scheme in operation whereby units replace each other in camps to which a sanitary area is attached. In this way the incoming unit finds, as a rule, an incinerator ready for its needs and a piece of ground marked out for latrines, manure burning and other sanitary requirements. Generally speaking, the camp sites have been well chosen and the camps are well laid out. As is our general experience, camps occupied by regular units were more comfortable and in a higher state of sanitary efficiency than those not so tenanted, a fact which emphasizes the advantages of a sound training and good discipline.

22. The troops are housed in tents which are either pitched on ground level or cover dugouts. Where the necessary labour has been available, as in the case of Sappers and Miners, very comfortable excavations have been made to serve as dwellings. In the few dugouts which are properly roofed with timber, corrugated iron, soil and sandbags, the difference between the outside and inside temperatures may be as much as 15° F. While excellent in the dry season the unroofed shelter will infallibly be flooded during the rains. For purposes of greater mobility E. P. tents are being withdrawn and troops are for the most part again housed in single fly G. S. 160 lbs. tents. Under present climatic conditions this entails no hardship but, were labour can be got, it would be well in the more permanent camps to guard as far as possible against the intense cold and rains of the winter by mud brick buildings. Even if, owing to lack of material, these can only be roofed by tentage the thick walls will afford shelter and comfort and if properly "leaped" will withstand stormy weather. Units occupying a camp for a short period only are naturally not inclined to undertake any arduous work in this direction, but every now and then it will be well worth their while to do so and after all they can reflect that it is not lost what a friend gets.

23 The field ambulance camps of the various divisions appeared to us very good in all respects. For the winter they require stoves which have been requisitioned and should soon be supplied as the nights are getting very cold. For next hot weather a provision of hot air fans or punkahs with punkah-wallahs should be made and *khas-khas* tatties could be used with great advantage in many places where the water-supply is ample. These supplies would greatly facilitate the treatment of men suffering from the effects of heat and from actual heat stroke which caused so much invaliding and so many deaths last summer.

24. The question of lighting is one of great importance. Lieutenant-Colonel Wauchope of the Black Watch, to whom we are indebted for much useful information as regards regimental needs, pointed out to us that the supply of illuminating oil was to be reduced so that only three lamps would be available per battalion. He considered this much too low a scale. A badly lighted camp is apt to be a dirty camp, while insufficient light during the winter will infallibly interfere with cooking operations and with the quality of the men's meals. We therefore trust that a more liberal scale will be sanctioned.

25. Men as a rule mess in their tents, and scraps are collected in covered refuse tins. In some cases unsterilised sand was used for scouring men's tins, plates, etc. We recommend the use of sand sterilised by boiling water in a

dixie for this purpose or the employment of wood ash which some units preferred. In one camp we found that a very good messing-recreation shelter had been constructed by stretching a marquee over a large pit in which earthen tables and seats had been fashioned. During dry weather more might be attempted in this direction of providing such dug-out messing and recreation quarters and allotting them any roofing or other material which could be spared. Just as it has been settled that camps are to be left with their sanitary areas fully equipped, so might such advantages as mess-huts or cook-houses or shelters be left for the benefit of the incoming units.

6. COOKING AND COOK-HOUSES.

26. In nearly every part of the area cooking is done in dioxies or field ovens in the open. The arrangements are usually rather primitive and, probably because of the constant moves, it is only here and there that efforts are made to delimit the cooking area and provide shelter against wind and dust. Of what can be done in this direction we had a notable and praiseworthy example in the camp of the 1st Manchesters where an excellent, though as yet unroofed, kitchen had been constructed of mud brick. Elsewhere sacking, canvas, corrugated iron and excavations in the soil were occasionally employed for the purpose, and these simpler methods answer well enough at present. Later on, however, in camps which are likely to remain in use over the winter months it will be imperative to supply material for the construction of proper covered cook-houses. In many places the walls can be made of mud-brick but timber and corrugated iron must be supplied for roofing purposes or it will be very difficult to carry on. A simple standard pattern can readily be evolved by the Engineers.

27. At one camp we saw an example of an ingenious, cool, underground larder for the hot weather. A wind-shoot with an improvised cowl admitted a draft of air which passed through matting kept constantly wet by dripping water. As a result meat could be stored in this cold and fly-proof chamber until it became tender and more suitable for the table.

28. During our inspection we only saw one field cooker and there can be no doubt these are urgently required in the winter, especially for troops on the move. We strongly recommend their issues for British troops.

29. A supply of washing soda would be of great sanitary advantage, it would secure better cleansing of cooking utensils used by the men.

30. Here and there complaints reached us that the dioxies were wearing out and that it was not always easy to get the worn ones replaced. As a rule, however, this is only a question of time but an effort should be made to supply such deficiencies as quickly as possible. Lack of transport is chiefly to blame. Before next hot weather the cook-houses require a supply of wire gauze covers for meat, etc., and the number of small fly-proof larders might with advantage be increased. This again is largely a question of material, much could be done with empty boxes which are at present chopped up for fire-wood.

The Indian cooking places were generally clean and well looked after.

7. SLAUGHTER-HOUSES AND BAKERIES.

31. There is a central *slaughtering place* for British troops in each division. Slaughtering is done in the open and the conditions, though primitive, are not productive of any nuisance. The ground and pits are well looked after. Shelters for hanging meat might be improved. We understand this matter is under consideration, and it assumes greater importance now that the slaughtering is done in the afternoon and the meat not issued until the next morning. The burial of offal and hides is rather a problem, but there is plenty of ground and the pits do not seem to breed out flies. If too shallow, jackals are apt to get at their contents. It might be possible, with due precautions, to dry intestines, etc., on scaffolding, spraying them with crude oil or perhaps better, with solution "C" and then incinerating. It is a pity that hides have to be buried for they are a valuable commodity. We hope that the Corps Commander's scheme of dealing with them at central butcheries so

that they can be exported will soon be realised. The Indian units at present slaughter locally, but an arrangement is being made for central slaughtering places both for Hindus and Mohammedans in each of the three divisions. This would seem to be a wise provision, though we did not find the present arrangements cause nuisance. In the fly season, however, it is undesirable to multiply potential nurseries for larvæ while jackals are said sometimes to scatter about the offal from shallow pits. In any case oil should be freely used in such pits.

32. *Bakeries.*—The Committee inspected several of the bakeries. These appear to be very well managed and the quality of the bread is excellent. Some of the bakeries even produce breakfast rolls. We had no complaints regarding the flour. The supply is ample. The preparation of the dough is carried out in a very poor class of single-fly tent which on windy days admits dust and sand in large quantities. The bakers should certainly be given a better shelter for their work.

8. ICE AND SODA WATER.

33. It is essential that at the beginning of next hot weather an ice factory be established at some central and convenient place, either on the river or the railway. The value of such an institution for the supply of ice to hospitals and field ambulances is sufficiently evident. Heat-stroke and heat-exhaustion were amongst the chief causes of death and invaliding last summer, and without ice the treatment of such cases is heavily handicapped. If positions remain more or less as at present, Sheikh Saad would be a suitable site. Field ambulances are now provided with aerated water plants and these have proved a great boon. They are well managed and the only trouble in connection with them appears to be the shortage of bottles. These should gradually be collected and stored during the cold weather.

9. CLOTHING.

34. We have gone carefully into the question of clothing for British troops during the winter months and have obtained the views of brigadiers, regimental and medical officers, quartermasters, quartermaster-sergeants, and of the men themselves upon this important point. There is a marked preponderance of opinion in favour of serge tunics and trousers as against khaki drill. We need scarcely enter here into the pros and cons of the subject but, on the balance of the considerations before us, we think the view of the majority is sound. As we know the matter has been under discussion we trust that due notice will be taken of the result of this enquiry and that serge of satisfactory quality will be issued. We would also suggest the supply of a spare puttee to every man in the force. It can be utilised at night as an abdominal belt by those who are apt to suffer from chill or find it comforting.

We would draw attention to the unsuitable nature of the material from which the new grey puttees issued to British and Indian troops from India is constructed. It is harsh and has very little pliability. On a long march it is likely to chafe the skin and prove a source of discomfort.

35. As regards clothing for the sick and other comforts it has been represented to us that it would be an excellent thing if the Red Cross Commissioner in Basrah or his representative visited the advanced area not only to see hospital medical officers but also to confer with the medical officers in charge of units, in order to ascertain at first hand what is required. The field ambulances like the hospitals generally, have been admirably served by the Red Cross but the above suggestion would appear well worthy of consideration.

10. RATIONS.

(See Section on Scurvy—Paragraphs 69—85.)

11. COLLECTION AND DISPOSAL OF HUMAN EXCRETA.

36. With the exception of certain strong points and redoubts the system in force is that of incineration and nowhere have we seen it more efficiently carried out. This is due in large measure to the fact that the sanitary sections are on the Indian basis and that British regiments in the area have Indian sweeper personnel. It is also, however, due to the care exercised by the sanitary officer in charge and to the types of incinerator adopted. We were interested to find that at Sannaiyet the method was actually in use in the trenches and we were able to observe the special but simple form of incinerator employed in this area.

As already indicated each camp has a sanitary area in its proximity and in this area one finds the latrines, urinals, a closed incinerator for human faeces, one or more open incinerators for litter, horse manure and refuse, areas for drying wet refuse and drying and burning horse manure, sometimes sullage pits for kitchen waste-water and, in the case of Indian units, pits by the side of the latrine for ablution or "abdust," which, if well contrived, are covered and provided with tin lined troughs.

The areas are marked by flags and situated to leeward of the camps.

37. *Latrines.*—British latrines in nearly all cases are provided with petrol cans. These are placed in some form of wood casing having wooden lids or else covered by lids of perforated zinc, by tops of tin sheeting or by sacking soaked in crude oil. Only rarely did we find the tins or half-tins (for the separation method for urine and solids is in use amongst some units) without any covering at all. The sacking covers were in very general use in Indian latrines, and we saw an ingenious arrangement with *bhusa* bands which did away with the usual objection on the part of the Indian to touch such covers. Another and more elaborate scheme is to have a hinged lid attached by a cord to a stirrup operated by the foot. Crude oil, when obtainable, is being used as a fly repellent.

In some areas the latrine tins were placed in trenches which were covered by sacking. In this way the latrines were kept cool, dark and largely free from flies but in such cases there is a danger that out of sight may mean out of mind. In the rains such trench latrines will be liable to flooding so that they are only suitable for the dry season. Those we inspected were clean and apparently well managed. In the Sannaiyet trenches petrol cans covered by sacking were in general use. We suggested that the sacking might with advantage be weighted round the edge either, as we saw elsewhere, by heavy wire, or by a collar of sand sown up in the cover.

38. The incineration method is as a rule not suitable for the strong posts or small redoubts along the railway and elsewhere. Here a system of deep trenching is permitted and regulations have been issued which, if carefully enforced, should prevent any nuisance or fly-breeding on a large scale.

In the case of British troops occupying such posts it would be well to employ the oiled latrine boards furnished with leather handles and set side by side as mentioned in our Basrah and Sheikh Saad reports. These boards will also be found useful for troops on the march. They are easily carried on pack animals.

39. *Incinerators.*—Faecal matter, along with a certain amount of dried litter or refuse, is burnt in closed incinerators of mud or mud-brick. Several types of closed incinerators are in use. Two of the types seen struck us as especially good. One of these was devised by Captain Gow, D. S. O., I. M. S., for Corps Headquarters and may be termed the crinoline type, inasmuch as its domed portion is supported by a cradle of hoop iron. The other, erected by Lieutenant Brown, I. M. S., throughout the 3rd Division, had the brick courses of its upper part arranged in the so-called crow-step fashion and possessed a central column of perforated kerosene cans. This we consider an advantage, as it appears to lead to a more thorough combustion. Both types, however, were working very well. There is a great lack of proper incinerator bars. A large supply was requisitioned in August but unfortunately was not

sanctioned. As a result *bhusa* bands are largely employed and these soon give out. We trust an ample supply of good iron bars may be forthcoming at an early date.

12. COLLECTION AND DISPOSAL OF REFUSE AND HORSE MANURE.

40. As already stated refuse is collected in covered tins or sacks. It is conveyed to open incinerators in the sanitary area. Cook-house sullage is also collected in this way by some of the units and brought to sullage pits provided with strainers also situated in the sanitary area but in our opinion it is better to follow the more general custom of having the sullage pits close to the cook-houses.

When refuse is damp it is spread out and dried in the sun, when dry it is at once consumed in open incinerators. In the 7th Division we noticed one of these open incinerators with a cap of *bhusa* bands which prevented papers, etc., being blown away. The same end is secured by erecting a frame work of bands or a stretch of wire netting on the leeward part of the incinerator wall. In the Sannaiyet trenches we had evidence that a good deal of refuse in the shape of tins, etc., was being thrown over the parapet. This probably accounted in some measure for the considerable number of flies which were present. Every effort should be made to put an end to this dangerous practice.

41. A certain amount of horse manure is burnt in open incinerators but in many places the quantity which has to be dealt with is too large for disposal in this way. Hence many units burn horse manure and litter on the ground. Where this is carefully done by the so-called ridge method, after preliminary drying in thin layers, a good and complete ash is obtained, for the prevailing strong wind aids the burning. Here and there, however, and especially in the 14th Division, we found units which were careless in this respect and were trying in vain to burn their horse manure in heaps. In places it was accumulating, had evidently got out of hand and was in danger of becoming a breeding place for flies. We are of opinion that where the amount to be consumed is very large, recourse might be had with advantage to a modified form of the open "American" incinerator. This has a central column of perforated kerosene cans round which other tins are loosely heaped in the form of a cone and secured in position by wire and mud plaster. Ventilating shafts of kerosene tins set end to end communicate with the central column and radiate out from it at or slightly below ground level. A low mud wall runs from outer end to outer end of these open channels enclosing a circle, the floor of which is paved with flattened tins. Manure is piled upon this floor and against the cone, and when once alight the strong draught through the burning mass facilitates combustion. Captain Gow is now trying one of these incinerators at Corps Headquarters and will report upon its efficiency.

At the camp of No. 13 Company, Sappers and Miners, 14th Division, we saw a large ridge of horse manure being burned on the floor of a deep pit. This pit had a shelving side to windward so that the ridge was not shut off from the breeze. It was burning well and the method would seem to be a labour-saving device, as soil excavated from the pit can easily be shovelled over the ash, the pit being thus filled up.

In our report on Gurmat Ali Camp, Basrah, we referred at some length to methods of dealing with horse or mule litter at cavalry or transport camps in cases where incineration has not kept pace with the manure. In such cases it may be best to make regular stacks of the manure, which should then be covered with a thick coating of sand and oil. Great heat is generated and any fly larvæ present are killed while gravid females cannot get at the manure to oviposit there.

42. It should be understood that the improvisations from mud, kerosene tins, and *bhusa* bands in the "sanitary" area which we have described and commended above, are not likely by themselves to be sufficient for these areas in the cold and wet season which will shortly begin. Shelters for latrines will then be very necessary. Some top covering or roofing will be required to secure sufficient dry litter to keep the incinerators going, and the domes of the

mud built incinerators themselves will probably need protection. A great deal in this direction can be done by relatively small allotments of corrugated iron and wood, to be used economically under the advice of the Sanitary Officer, and we trust the importance of such a supply will be fully realised.

13. INDIAN SANITARY SECTIONS AND SWEEPER PERSONNEL.

43. It is necessary to say something as regards sanitary sections and sweeper personnel. The new Indian Mobilization Store Tables for the Field Army, dated 19th June 1916, lay down the War establishment of a sanitary section, which as regards personnel appear to be quite satisfactory. The almost total lack of transport facilities in this establishment, however, has been brought strongly to our notice. Each British sanitary section is provided with a motor lorry to transport its men and equipment but, at the best, the Indian sanitary section has one small cart. This is quite inadequate. Now it is essential that the sanitary section, if not actually the first unit on a new ground, should be amongst the first to get there. As things are at present it is too often the last, and irreparable damage may be done owing to its absence at the critical time when troops are occupying a new area. We would, therefore, press strongly for adequate transport for each Indian sanitary section, either a large motor lorry or its equivalent, for example, two G. S. carts or 3 limber wagons. Such transport is equally required for every day work as when the men of the section have to be conveyed several miles to build incinerators, etc.

44. In the Indian Field Force the various units have Indian sweepers attached to them and these are independent of the sweeper personnel of the sanitary sections. While the latter and the field ambulances appear to have had their sweeper personnel kept well up to strength we find that this has not been the case in some of the regimental and other units. Complaints have been made to us that repetition of applications to the Assistant Adjutant General, 3rd Echelon, at Basrah, to make up deficiencies has been discouraged and units have been informed that every effort is being made to satisfy their requirements. The fact remains, however, that the sweepers, on whom so much depends, where the incineration system is adopted, are still often very deficient in numbers, and from what we saw and heard at Basrah, it seems to us that part of the trouble is due to sweepers ear-marked for units in the advanced area, being pressed into service at the Base. If the recommendations as regards enlarging permanent sweeper establishments there, mentioned in our Basrah reports, are carried into effect, this state of things should terminate and the troubles and hardships which advanced units have had to undergo become largely things of the past.

14 FLIES AND OTHER INSECT PESTS.

45. By all accounts flies were exceedingly bad during the earlier part of last summer. They caused great discomfort and doubtless played an important part in spreading disease of the "enterica" and dysentery class (see section below). It is therefore very necessary that every effort should be made to cope in time with the fly plague so that by next spring an organization will be in force which will limit its intensity and powers for evil. This can certainly be done if sufficient forethought and energy are displayed.

46. At the present time, except in certain areas, such as the Sannaiyet trenches, Arab Village and the open Nullah at present occupied by the 32nd Punjabis, flies are not greatly in evidence and, so far as we can ascertain from our own observations and from information furnished by Mr. L. D. Harrison, the Fly Expert with the Corps, breeding places are not numerous in the vicinity of camps. The advanced area possesses one great advantage in that native villages and itinerant natives are absent and the deposits of human ordure can be kept more or less under control. Hence in this area horse manure and damp refuse are most likely to be the sources of flies. The species chiefly in evidence are *Musca domestica*, *Musca sp.*, *Lucilia sp.*, *Sarcophagidæ* and the biting *Stomoxidæ*.

47. As Mr. Harrison has pointed out it is not easy to forecast what will happen in the spring for the troops may have moved out of the areas at present occupied and new factors may be introduced which will modify the fly problem. At the same time certain cardinal points emerge and these may be tabulated as follows:—

- (a) The greatest possible use should be made of the three fly experts at present in Mesopotamia. With this in view, Messrs. Grove and Harrison who are at present civilians should be granted temporary commissions, as such a step will greatly facilitate their getting about and add to their usefulness. Moreover, it is only fair to men who have to go into positions of danger and have to deal with British and Indian officers. This proposal had already been put forward by the Deputy Director, Medical Services, but on the occasion of meeting the Commander-in-Chief at Twin Canals, we took the opportunity of emphasizing its importance. We understand it is to be carried into effect at an early period.
- (b) These fly experts should spend the winter in giving practical instruction on fly morphology and methods of fly prevention and destruction, not only to medical officers in field ambulances and with regiments, but, like the gas expert, to all concerned. They should also aid in training the personnel of British and Indian sanitary sections both in inspection and preventive work.
- (c) The scheme hitherto adopted by the Deputy Assistant Director, Medical Services (Sanitary), has been to utilise the services of the Assistant Entomologists from India in the formation of small fly brigades in each division. These fly brigades have usually included 3 bildars from the Indian sanitary sections and one or two sweepers, the whole being under the control of the fly expert. The scheme, however, has been greatly hampered by the latter's civilian status. The Assistant Entomologists are unlikely to return to Mesopotamia and their place should be taken by British and Indian non-commissioned officers from sanitary sections who have received special instruction from the fly expert. The fly brigades should be continued and strengthened when necessary. Bildars and bhistis can often be spared from their usual work and can easily be trained in the detection of fly larvæ and pupal cases. The sweepers are only necessary for dealing with special fly-breeding deposits. Considering the great importance of an anti-fly campaign we would suggest that more use should be made of the officers and men attached to field ambulances. Unless active operations are in progress those who have time to spare for the extra duty could be employed with advantage and benefit both to themselves and their neighbours.
- (d) There is an ample supply of anti-fly sprays and the equipment for an anti-fly campaign appears sufficient. Owing to the occurrence of an unfortunate accident the most important of all the fly poisons, *i.e.*, arsenite of soda has been withdrawn from use but, in our opinion, it will be imperative to remove the embargo placed on this substance and to reissue it after due precautions as to colouring it with ultramarine or some other dye stuff have been taken.
- (e) Out-of-door cage fly traps should be built in large numbers and used early in the season especially in trench areas and other places where it is difficult or impossible to get at breeding places. Plans of and information regarding these traps have been circulated at the instance of the Committee.
- (f) If the Force continues to occupy its present positions the existing staff will, in the opinion of the Deputy Assistant Director, Medical Services (Sanitary), suffice, but if the army is on the move it would seem advisable to strengthen it by the addition of another fly expert who should be given rank as above indicated.

48. *Sand-flies (Phlebotomus)*.—These are a great pest, and, besides conveying the infection of phlebotomus fever which has been widely prevalent, they are possibly the vectors of *Leishmania tropica*, the protozoal parasite of Oriental sore, some instances of which have been met with among the troops. The best repellant for them would seem to be “vermijelli” of which there is a large stock, and this substance should be used more extensively than has hitherto been the case. Something can be done in the way of reducing their numbers in the dug-outs and shelters by fumigating with sulphur and the use of simple box traps painted black inside or lined with dark cloth. The type found most useful has been indicated during the course of our inspections.

49. *Mosquitoes*.—These are not and have never been much in evidence within the area at present occupied by the Corps.

Anopheles pulcherrimus Culex fatigans and a species of *Thevebaldia* have been observed but nowhere in large numbers.

It is possible that, if Kut were occupied, the irrigated land in its vicinity would require the attentions of a small trained mosquito brigade, and in any case the condition of any such areas, as regards mosquitoes and malaria, should receive early, and expert attention if they are to be occupied by troops.

At present such breeding places as exist can readily be dealt with by the sanitary sections.

Lice.—At present there is very little lousiness but it must be remembered that it was much in evidence last winter.

15. FUTURE ARRANGEMENTS FOR CENTRAL SANITARY AND PREVENTIVE WORK IN THE CORPS.

50. While at Ess Sinn we learnt that, when the force at the front again becomes four divisions, a re-arrangement will take place by which these divisions will be comprised in two army corps instead of one. We gathered that in that event neither of the new army corps, nor the force at the front as such, would have a Deputy Director, Medical Services, or Deputy Assistant Director, Medical Services (Sanitary), the medical and preventive work being carried out by the Assistant Director, Medical Services, and sanitary officers of the divisions, would be instructed by and report to the Director, Medical Services, direct. On consideration of this proposal we sent the following telegram to the Director, Medical Services, on October 24th:—

“Advisory Committee consider present good sanitary condition of Corps largely due to the co-ordination and supervision of work of the different divisions by Deputy Assistant Director, Medical Services (Sanitary), with Corps. Understand that this office will disappear when new army organization takes effect. If so Committee trust that new arrangements will be made to continue work referred to utilising present experienced officer for the purpose. Committee hope to confer with you on subject on their return Amara. Balfour, Buchanan.”

We have since had the opportunity of discussing this matter with the Director, Medical Services, and find ourselves strengthened in the opinion above expressed, which we desire here to repeat and emphasize. The reasons have already been indicated above under “General Considerations” and need not be laboured as they run all through this report, both as regards special sanitary measures and disease prevention generally. Looking to the influence which preventable disease has had upon the present campaign, it seems to us essential that the commander or commanders of the force at the front should have on the spot the advice and assistance of an expert officer with local knowledge whose business it is to consider the health requirements of the force as a whole. The methods of sanitation, water purification, and the like, of the different divisions ought be closely co-ordinated if efficiency is to be secured, particularly as these divisions must frequently overlap in area. Moreover the progress and prevention of disease needs to be vigilantly watched by an officer in close personal touch with all parts of the force.

The facts given below as to cholera and scurvy will sufficiently illustrate the impossibility of making their prevention a merely divisional matter.

51. We have limited the above recommendations to the Deputy Assistant Director, Medical Services (Sanitary), with the Corps, and it is with his side of the medical work that we have been most closely concerned. But we imagine that similar considerations apply to other branches of the work for which the Deputy Director, Medical Services (Corps), is responsible. Absence of ready and up-to-date information as to sickness and hospital accommodation or of necessary co-ordination in regard to the use of hospital and the system of evacuation might for example, easily produce serious trouble during an epidemic, or even lead to unnecessary spread of infection.

16. PREVALENCE OF SICKNESS AND OCCURRENCE OF PARTICULAR DISEASES IN THE CORPS.

52. In the earlier months of this year, most of the regiments and other units (British and Indian) now in the area, formed part of the force which attempted the relief of Kut. This applies to the 3rd and 7th Divisions and to some units now in the 14th Division, which came into being at the end of May. About that time the 13th (the only all British division), which is not now in the Corps Area, began to go down to camp at Sheikh Saad.

The troops took part in the active movements and operations which continued for a short while after the surrender of Kut at the end of April; since that time the Corps has remained in the region it at present occupies, though camps and positions have frequently been shifted.

The available information as to sickness in the Corps, particularly in the early months of the year, is necessarily meagre. Before July few records were kept, and it is only possible here to refer to certain outstanding points.

53. *Winter and Spring conditions, 1915-16.*—Apart from the occurrence of some rheumatism, pneumonia and malaria in certain Indian units, we obtained little information regarding prevalent epidemic sickness during the colder months at the beginning of the year. With the advent of warmer weather in March and April, various conditions began to operate which were favourable to the spread of epidemic dysentery, enterica and diarrhoeal diseases. Flies seem to have reached a maximum of prevalence in April, and were about in great abundance. The disease in question were undoubtedly prevalent at this time, but we have been unable to estimate their extent; the troops were busy fighting, and field ambulances and the Assistant Directors, Medical Services, had little opportunity for exact observations or keeping records.

54. *Cholera.*—In April cholera broke out in the 3rd Division and also in the 13th Division which was then with the Corps: some 170 cases (British and Indian) being reported from these two divisions on the 30th April. The cause was traced on clear evidence to the polluted water of "Cholera Creek" a cut bringing water from the Tigris. In all probability the infection was attributable to the Turks, as two Turkish prisoners were taken who were suffering from cholera. At this time there was no chlorination or other treatment of the dangerous waters drunk by the men, and the conditions may well have prevented any attempts at chlorination.

55. In such conditions, however, much may be done by the issue of acid sodium sulphate tablets for sterilization of the water in water-bottles, etc., and as the same conditions may be met with again when troops are actively on the move, we would urge that a sufficient stock of these tablets should be kept by medical officers in the advance area. Regimental medical officers should understand the emergencies in which these tablets should be issued and used, and give all necessary advice in the matter when the occasion arises. We find that the tablets are available, and arrangements have now been made for their distribution.

The subsequent history of cholera has been reassuring coincident with the introduction of the water arrangements described in section II of this report, the cholera cases, with one or two doubtful exceptions only, have been found

to be referable to importation of infection by men coming up river, and not to any local source. In all, about 13 cholera cases have occurred in the Corps since June and none since September. It is, we believe, fully realised in this area that the risk of serious epidemic cholera needs constantly to be guarded against, and particularly in the spring.

56. *Summer months*—May and June were months of very serious sickness, and the casualties caused thereby to officers and men were a dominant feature in the efficiency of the Corps. The approximate total evacuations down river—practically all on account of sickness—were, according to Corps records:—

	British officers.	Other British ranks.	Indian.
In May	180	2,250	1,360
In June	210	2,400	2,200

This sickness appears to have been largely due to the diarrhoeal group of diseases, including paratyphoid and dysentery, to jaundice, and to effects of heat. A high rate of sickness continued in July, being augmented not only by the effects of heat, but by the scurvy in Indian troops which then began to contribute materially to the totals. It is worth noting that after the onset of the hottest weather the flies almost wholly disappeared, being doubtless killed off by the intense heat and drought.

57. *"Effects of heat."*—We are unable to give figures for the disease group which has since been classified under this head. Up to the end of July, when the Shamal wind began, and to a less extent for some time afterwards, British troops suffered very severely from "effects of heat" and from actual heatstroke, which was responsible for many deaths. The maximum daily shade temperature was usually somewhat about 110° F. and frequently rose much higher. Instances were mentioned to us in which inexperience on the part of the officers and men, or want of discipline, added largely to the danger; for example, where men bathed in the middle of the day or neglected to put on their helmets or spine pads. In any case, the usual 160 lbs. G. S. single-fly tents in such temperatures and on these open desert camping grounds afforded far too little protection. Double-fly E. P. tents were not got up into the Corps Area as a rule until the end of July or August. We have referred elsewhere in this report to certain additional provisions which should be made at field ambulances and elsewhere in anticipation of the next hot season and we propose, if necessary, to comment later, after inquiries on Lines of Communications and at the Base, on the progress made in anticipating the requirements of next summer.

58. Our attention was often drawn by medical officers and officers commanding British units to the quickness with which men who had arrived in Mesopotamia direct from England in the hot weather had succumbed to the effects of heat, either while on their way to join their unit at the front or after reaching the unit. By contrast the new drafts which had come from British regiments in India were stated to have been much better in this respect. The younger men (*e.g.*, under 25) were also found to have suffered to a disproportionate extent. The conditions of the hot months also often led to complete loss of recuperative power after diarrhoea, sand-fly fever, and other diseases which normally would be soon recovered from and in this way greatly swelled the rate of evacuation from sickness.

59. *Diseases due to food deficiencies: Scurvy and beri-beri.*—We obtained information from one or two British regiments as to the periods, earlier in the year, when they had long spells of diet practically limited to "biscuit and bully"; of the shortage which, down to July at least, often occurred in the fresh meat, oatmeal, tinned milk, cheese or other items theoretically included in the official ration; and of the absence of fresh vegetables. We are unable to indicate the extent to which such deficiencies directly, or indirectly, contributed to the occurrence of anaemia, debility or other sickness in the British ranks. It is certain, however, that they have not produced scurvy (save for an isolated case here and there) among British troops. Last year certain food deficiencies in British troops in Mesopotamia appeared to have resulted in beri-beri; fortunately only one clinically well

marked case (seen by Colonel Willcox, A.M.S.) has been reported in the Corps area this year. As a prophylactic against beri-beri, yeast-food tablets ("marmite") are being sent out; but the non-appearance of beri-beri this year has been independent of this precaution.

60. At the dates of our inspection we saw no reason to consider that the food supplied to the British troops was insufficient in quantity or (save as regards fresh vegetables) deficient in any important items. The quartermasters, quartermaster sergeants, company cooks and the men of whom we inquired appeared well satisfied. The British troops, in common with the Indian, had then for some weeks benefited by improved supplies—the result partly of more successful transport or local purchase of meat on the hoof, and partly of the relief to supplies at the front which followed the temporary withdrawal of the 13th Division from river-head at Sheikh Saad down to Amara.

We may add here that, at the date of writing, the new winter ration (British and Indian) has just been issued (General Routine Orders, October 31st, 1916). The British ration appears to be generous, and satisfactory in its several items. Hitherto it would have been very misleading to take the ration scale (or scales, for there have been many alterations and modifications) as evidence of the food which is actually supplied to the men. We understand, however, from the Deputy Director, Supply and Transport, that conditions of transport and the system of supply are now so rapidly improving that the two should shortly become identical, if indeed this is not already the case.

61. As regards the Indian troops with the Corps matters have been very different; scurvy, which was prevalent in Mesopotamia last year and in the early months of 1916, began to assume serious proportions in June, and from July to the present date has been by far the principal factor of sickness in the Corps. We have referred to this subject in a separate section below, with some interim observations on the Indian rations.

62. *Last summer and autumn.*—The following totals are from a return supplied by the Medical Statistical Officer, General Headquarters.

Total fresh admissions of sick from the 3rd Indian Army Corps—(3rd, 7th and 14th Divisions and Corps troops):—

Week ending	British.	Indian.	Total.
August 5th	299	782	1,081
„ 12th	277	1,208	1,485
„ 19th	271	1,200	1,471
„ 26th	296	1,072	1,368
September 2nd	293	909	1,202
September 9th	322	1,126	1,448
„ 16th	322	1,144	1,466
„ 23rd	267	1,206	1,473
„ 30th	279	978	1,257
October 7th	306	827	1,133
Five weeks, July 30th—September 2nd .	1,436	5,171	6,607
Five weeks, September 3rd—October 7th .	1,496	5,281	6,777

The above large totals have mainly been determined by scurvy in the Indian troops. Apart from this, much of it has been of a minor character, *e.g.*, "sand-fly" fever, diarrhoea, etc., often intensified by the effects of the trying summer.

63. During September, and still more markedly in October, the health of the troops has improved to a much greater extent than is indicated by the figures of new admissions of sick. It must be remembered also that a process of weeding out the less resistant (especially in regard to scurvy) has also been going on automatically for some time. The latest drafts are to some extent men who have escaped the hottest season in Mesopotamia. The changed climatic conditions have now brought about a conspicuous general improvement in energy and health.

64. The effect of the sanitary and preventive measures detailed in the earlier part of this report is apparent, to a gratifying extent, in the group of communicable diseases of intestinal origin. We inquired specially as to these diseases at the field ambulances and when visiting the Assistant Directors, Medical Services, of the divisions and the different regiments. Here and there (especially in the 7th Division) small groups of cases of dysentery were occurring (probably bacillary, see below), but generally the prevalence of the diseases, particularly of suspicious enterica, was slight and sporadic. We attach more importance to these impressions than to the figures on the point obtainable from field ambulance returns; for what they are worth, however, the following are the total admissions from the Corps for the eight weeks ended October 21st:—

Cases diagnosed as "enterica group"	58
" " "dysentery group"	351

The cases admitted during this period which had only been diagnosed as "P. U. O." at the date of the return totalled 973. It seems to us improbable that many of these were cases of the enterica group.

65. We are glad to note that steps are now being taken to acquaint the Assistant Director, Medical Services, of each division, and through him the field ambulances and regimental medical officers, when cases evacuated from the Corps Area to hospitals down river have been reported, as a result of bacteriological examination, to belong to the enterica group. Measures such as this which enable the men on the spot to have better and quicker knowledge of what has been in hospitals and laboratories on Lines of Communication and at the Base are of the greatest value, and should be extended as much as possible. We may here suggest also that the copies of the weekly statistical return for the whole force as regards total sickness and infectious disease which are prepared in the Director, Medical Services' office, may be usefully communicated to the Deputy Director, Medical Services (Corps), and other principal administrative officers, as a matter of routine.

66. *Malaria* has already been referred to (section 15). The cases appear practically always to have been contracted in Basrah or elsewhere down river, or to have been relapses of old infections. Only one or two cases of true *Oriental sore* appear to have occurred. It is apt to be mistaken for veldt sores (staphylococcic infection) which have been common.

Attention may also be directed to the possibility of anaemia, oedema and debility in Indian troops being attributable to *ankylostomiasis*. Medical officers with Indian units should be on the outlook for this disease and not confound it with certain of the scorbutic symptoms.

Other diseases do not appear to call for comment except *sand-fly fever* (already mentioned).

17. SCURVY AMONG INDIAN TROOPS AND FOLLOWERS IN THE CORPS.

67. As above indicated (paragraph 61) scurvy had been prevalent, to a relatively small degree, among the Indian troops of the Corps in the earlier months of this year. It had also occurred in Mesopotamia in 1915, and

apparently this disease, though rare among troops in India, is a not uncommon accompaniment of expeditions on the Indian frontier. In May and June, however, its prevalence in the Corps became sufficiently marked to call for special notice. The Assistant Director, Medical Services, 7th Division, drew attention to the matter in June, and on July 23rd an important memorandum indicating the seriousness of the position was prepared in the office of the Deputy Director, Medical Services (Corps).

In the 19 weeks, June 26th—October 22nd, 1916, the number of cases admitted to hospital units as "scurvy" from the Corps (exclusive of the Cavalry Brigade) was 7,419. The following table shows, in the case of each division, the inroad made on the Indian strength by each week's admissions to hospital from "scurvy":—

New admissions for scurvy expressed for each week as a percentage of the total Indian strength.

Week ending.	3rd Division.	7th Division.	14th Division.
July 2nd	0.69	0.70	1.18
„ 9th	0.608	0.64	1.73
„ 16th	0.67	1.03	1.91
„ 23rd	0.89	1.09	1.75
„ 30th	1.5	1.29	2.24
August 6th	1.4	0.89	1.75
„ 13th	2.7	1.41	3.41
„ 20th	3.5	1.3	3.1
„ 27th	2.5	1.5	2.7
September 3rd	1.82	0.98	3.51
„ 10th	2.53	1.20	4.77
„ 17th	2.27	1.36	4.01
„ 24th	1.87	1.30	4.51
October 1st	1.71	1.11	2.15
„ 8th	2.43	0.90	0.87
„ 15th	1.11	0.70	1.04
„ 22nd	1.26	0.48	0.67

68. In connection with the above rates attention is drawn to the following points:—

- (a) A memorandum was issued to Assistant Directors, Medical Services, on August 6th, asking for systematic examination for signs of scurvy to be made, without waiting for men to report themselves sick, and for suspicious cases to be noted. The rapid rise beginning in the week ending August 13th, is largely the result of the action which followed this memorandum.

- (b) As scurvy is a chronic disease, usually with a very gradual onset, the weekly rates do not indicate the occurrence of new cases of scurvy in the week so much as the extent to which scurvy was looked for, or men reported themselves sick, or medical officers decided to send the cases for admission to field ambulances. These conditions varied greatly in different units.
- (c) As many medical officers were unfamiliar with the early diagnosis of scurvy, a considerable number of the "scurvy" cases which reached the field ambulances were due to pyorrhœa or other causes. Often the diagnosis was revised at the ambulance but, no doubt, instances occurred in which the original faulty diagnosis was accepted, and the case has consequently been recorded as an admission from scurvy.
- (d) On the other hand, there is no doubt that the great bulk of the cases have been true scurvy; often with well marked and characteristic hæmorrhages at the date of admission. We saw many severe cases at Base hospitals, at field ambulances, and in the camps.
- (e) Practically all the scurvy cases admitted have been evacuated to hospitals down river and thence to India. Provided the diagnosis is definite this is the only possible course; the long period and conditions necessary for recovery cannot under present circumstances be obtained in hospitals in Mesopotamia, still less by regimental treatment. The danger of keeping a slight scorbutic "just patched up" in a force at the front may be considerable; such a man is almost certain to fail in time of stress. Field ambulances, giving special diet and medical attention to Kohars showing signs of early though definite scurvy, have often been obliged ultimately to send them back to India.
- (f) The incidence of scurvy since June has persistently been heaviest on the 24th Division and lightest on the 7th Division; that on the 3rd Division coming midway. The 14th has throughout been the most inaccessible for supplies, and it is practically certain that differences between the divisions in regard to scurvy are primarily due to corresponding differences in food deficiency.
- (g) No regiment has been exempt, though they have suffered in unequal degrees. Sikh, Maharattas, Dogras, Gurkhas, etc., have all been affected; also mule drivers and the Indian personnel of mounted units, artillery and hospitals as well as sweepers and other followers. Cases, though relatively few, have occurred among the 3rd Brahmans and Madrassi Sappers and Miners.
- (h) A marked period of decline has set in since the first week in October in each of the three divisions. This is attributable in part, if not in the main, to the way in which the units have now been purged from their scurvy by repeated examinations, and in part also to improvements in food supplies, referred to below. Scurvy cases continue, however, to occur; we have seen numerous undoubted cases in which symptoms have only recently declared themselves. In cases where the information was obtained, few if any of the men had been in the advanced area less than three months; many had been a year more in Mesopotamia.

69. *Diet and other conditions associated with the prevalence of scurvy.*—We obtained much useful information from the officers commanding, quartermasters and medical officers of different Indian units in the Corps regarding the food of the soldier both at and before the time of their heavy sickness rates from scurvy. No attempt is made in this report to analyse this information, but the following points should be noted. We refer later to the direction in which the dietary has recently been altered and improved:—

- (1) The staple diet has consisted of atta or rice ($1\frac{1}{2}$ lbs.), dhal (4 oz.), and certain condiments. Fat is represented by ghi (2 oz.) and sugar by gur (2 to 4 oz.). The figures in brackets indicate the usual official daily ration allowance per man, but ration scales and allowances have frequently varied. There have been periods of short issue of the above substances, but on the whole their supply seems to have been fairly maintained.
- (2) The meat supply has been small and uncertain. Sometimes (*e.g.*, units of the 14th Division in April and May) there was no issue of meat for a week or more at a time; usually there were occasional issue of meat each week, but always in small quantities. The authorised daily ration, when meat was issued consisted (according to the scale at the time) of 4 oz. or 6 oz. per man reckoned on dead meat including bone; 4 oz. was the general reckoning until August in all the divisions, and in the 14th Division 4 oz. continued to be the allowance on meat days until October.

No general use has been made of fish from the Tigris, although there has been some individual fishing with rod and line or cast nets. Some attempts have been made with seine nets but these have been too light to withstand the current.

- (3) Fresh vegetables and fruit (including under this potatoes, onions, melons, bringals, pumpkins, limes, dates, etc.), formed a very small and capricious part of the dietary; indeed their supply was often negligible in the months of June to September inclusive. It is true that many efforts were made to get up fresh vegetables from Amara and elsewhere, limes from India, dates from Basrah and so forth, and an imposing total might be made of the weight or bulk of such articles as despatched to the Corps. But the conditions of packing, transport and distribution, together with the climate, combined to cause so much damage to fruit and vegetables that relatively little reached the troops in serviceable condition, and then only on rare occasions. The promise of an issue of three fresh limes per man would thus result in one lime mouldy, another decomposed, and the third hopelessly dried up; many other examples could be given. Certain small local gardens were started, but their produce hardly counted. Use was, however, often made of a "sorg" or spinach made from certain plants growing near the camp.
- (4) The milk issued was tinned milk at the rate of 1 oz. or 2 oz. per man, lime juice (see below) was not regularly issued and frequently not taken; supplies of timarind or cocum (*Garcinia indica*) were sent up in June have since continued part of the ration, being principally used as a tea.
- (5) The food taken by the men largely depends on the supply of fuel. This has often been short, even when supplemented by locally collected scrub and roots.
- (6) In some regiment much trouble was taken to procure all the supplies obtained from the supply and transport dump, to represent deficiencies at the time of drawing, to keep an eye on the issues to the men and secure uniform distribution. In some cases also additional supplies (*e.g.*, sugar) for the men had been obtained from India from regimental or private funds. In other units, however, much less seemed to be done in these directions. Another factor greatly influenced the food and meals taken was the amount of night work, which has frequently been heavy.

70. *Recent alterations and improvements in Indian diet.*—Conditions of food supply have distinctly improved in some parts of the area (*e.g.*, 7th Division) since the end of August, and during the last few weeks the improvement has been general in the Corps. It results from various active changes in the conditions of transport, into which we need not

enter, from the extension of local purchase, especially of sheep and cattle on Lines of Communication, and from the removal of the 13th Division to Amara, which has already been referred to.

The improvements have resulted in a larger and regular supply of food, approximating (save as regards vegetables) to the official ration scale. Meat has generally gone up to the daily 6 oz. now allowed per man; the small tinned milk supply has become more regular, while the fuel has also increased. Improvement in the vegetable supply has been less marked and more recent; potatoes however have lately made an occasional appearance while onions have been issued in good quantities and frequently in the past few weeks.

71. To the extent that the recent fall in the scurvy rate is attributable to these improvements, and not to other causes referred to in (h) above, the question is probably mainly one of meat. Fresh meat in Mesopotamia may be regarded as the equivalent of the large quantities of milk consumed by the sepoy in India which, together with fresh vegetable food, keeps him from becoming scorbutic at home.

We understand that this improvement in the regular supply of meat will be maintained. It should be improved also as a consequence of some very necessary measures which are being taken by the Deputy Director, Supply and Transport, to see to the better watering and feeding of animals driven up on the hoof; at present their loss of weight and consequently of their food value on the journey is often very great.

Another proposal, deserving every support from the medical side, is the substitution of general slaughtering places (under approved organization to meet Indian customs) for killing in the camps and forts. In this way meat will be issued by actual dead weight, not by estimate, and risk of unequal distribution will be minimized. Some other points in relation to the future dietary are referred to below in notes on the new winter ration scale. The prospect of any large improvement in the supply of fresh vegetables and fruit is for the present not very promising. We understand that until the February sowing only a makeshift policy can be adopted. We hope to inquire further into this matter on Lines of Communication.

72. Until a better fresh vegetable or fruit supply is assured, in addition to the improvements in meat and supplies generally, it is too soon to assert that the conspicuous diet deficiencies which have produced the scurvy epidemic have been removed. It is quite possible that a diet such as is now coming to the Corps may be sufficient in quantity and in anti-scorbutic substances to keep men clear of the scurvy line, but this cannot yet be accepted as proven.

73. From this point of view it is important to keep a close observation on the health of men who have recently come to the Corps. We recommend that the Deputy Director, Medical Services, should be asked to arrange and closely supervise a scheme of observation of such men. Selected units with knowledgeable and painstaking medical officers should be chosen; these officers should have special nominal lists of men joining the unit in each month, beginning, say, with August last, and should record under specified headings the condition of the man at each periodical examination. At the same time, particulars of dietary should be secured, checked as far as possible, and recorded. This arrangement should be additional to any general routine examinations of all ranks for the detection of scurvy.

74. In the 7th Division the Assistant Director, Medical Services, Colonel Ogilvie, has started a "scurvy observation camp," in charge of Captain Sheppard, I.M.S., to which all regimental medical officers are asked to send cases as to which there is any suspicion of scurvy. We have visited this camp twice, and it promises to be very useful. Captain Sheppard has also prepared a concise statement of the principal clinical appearances of scurvy for the information of medical officers in the division. We think that this, or a similar statement, might be more widely circulated. Elsewhere, where suspected scurvy cases are sent to field ambulances, it would be well if the medical officers of regiments and those of the ambulances could confer together as often as possible with a view to mutual understanding as to diagnosis and as to the conditions which call for admissions to the ambulance.

75. Disciplinary measures have had to be taken in some instances when scurvy has been self-induced by abstention from food, or simulated by malingering. These cases have received much notoriety. No doubt there has been a considerable number of men who have endeavoured to be sent back to India by these practices. We are convinced, however, that self-induced scurvy or malingering has been only a minor factor in the epidemic, and feel much sympathy with the protests which we frequently received against the idea that the Indian troops generally were adopting this means of evading their duty.

18. NOTES AS TO THE DIET TO BE GIVEN IN FUTURE TO INDIAN SOLDIERS AND FOLLOWERS.

76. The notes below relate to certain matters of quality or quantity which came to our notice in visiting Indian units in the Corps, or arise from the evidence as to the production of scurvy, dealt with in the last section.

We have taken the new winter Indian ration scale (General Routine Order, 31st October 1916) as a convenient basis for these notes as the scale will determine, more closely than hitherto, the actual diet which the troops receive. We realise of course that many administrative and technical considerations outside our knowledge must enter into the preparation of any ration scale.

77. *Atta and rice*.—The new scale (Appendix No. 3) maintains these staple cereal or starchy foods at the $1\frac{1}{2}$ lbs. per man of previous scales. This amount represents, probably, as much as the man usually cares to eat in the way of chapatties or boiled rice. We have noticed apparently good chapatties thrown into the incinerator.

78. *Fuel* is increased from a nominal $1\frac{1}{2}$ lbs. to 2 lbs. (wood). This is to the good, although, having regard to cold and wet weather conditions, the increase in terms of extra cooking value is slight. It is to be hoped that it will be enough to prevent the burning of packing boxes and cases which are often invaluable for storing food and for sanitary purposes generally. The sufficiency of the fuel allowance might, we think, usefully be inquired into after some weeks' experience of this new scale in the winter.

79. *Ghi* remains at 2 oz. per man. This amount of fat is small for cold weather—and contrasts unfavourably with the fat which in the British ration is contained in the 3 oz. of bacon, 3 oz. of cheese, and the extra 10 oz. of fresh meat.

We were frequently informed by quartermasters that the tins of ghi supplied were sometimes unsatisfactory through large excess of water. This was confirmed at the Supply and Transport supply depôt. If the unit was not living on its day's stores and could send the tins back to the Supply and Transport dump to be changed, no particular harm was done; sometimes, however, this was not possible, and the ghi had to be issued and caused complaints. The matter is one on which it might be desirable that the Supply and Transport officers at headquarters should obtain evidence (if this has not already been done) with a view to suitable action in India.

80. *Gur* also remains at 2 oz. per man. In the former scale, though not in practice, a further issue of 2 oz. per man was also allowed as an "extra." This 2 oz. of gur contrasts unfavourably, as regards sugar, with the British 3 oz. of jam or golden syrup plus 3 oz. of sugar, and in view of the fondness of the Indian for sweet food, and of what we understand to be the ordinary consumption of sugar in India, we have some doubts of the sugar sufficiency of the new ration. On visiting several Indian units, the need of more sugar for the men was pressed on us—notably in the 82nd Punjabis. It was stated that the sepoy obtaining his own food in India has been accustomed to ordinary sugar, which he has come to prefer to the molasses-like product "gur." An additional allowance of sugar, preferably of ordinary sugar, besides representing a valuable food, would apparently enable the men to prepare sweet drinks to which they are accustomed and improve their digestion and well-being. We would recommend that, if the supplies obtainable

make it at all possible, an additional daily allowance of sugar should be added to the dietary. If weight is a consideration some corresponding reduction might be made in the starchy foods.

In making the above suggestion we do not ignore the provision of the ration scale that an extra 2 oz. of gur shall be issued when fresh meat is not obtainable. We think, however, that it is unfortunate that gur should be issued on such a basis. Sugar, though a very valuable food, is not physiologically a substitute for meat, and possesses no anti-scorbutic properties—a point of importance whilst meat is being relied upon so largely as the scurvy-preventing substance in the dietary.

81. *Fresh meat* is, under the new scale, to be issued at 6 oz. per man and we have already indicated that the recent regular supply of meat in this quantity has probably been of the greatest advantage in preventing scurvy. The only observation we would make is that 6 oz. (reckoned on total weight with bone) is not of itself a large amount—the corresponding British quantity is 1 lb. Doubtless 6 oz. is as much as it is safe to reckon for at the present time. But the fact that a fighting man is a native of India should not form an obstacle to his having as much meat as he can get or will take, and it would be a misfortune that the issue should be stereotyped at 6 oz. if, and when, larger quantities can be obtained.

82. *Potatoes and fresh vegetables* are fixed at 6 oz. (or in substitution 2 oz. of dried vegetables when fresh is not available). The corresponding British allowance is 12 oz. (or 3 oz. dried). They are important anti-scorbutics, specially necessary for the Indian. Here again it is probably a matter of cutting the coat to the cloth, and useless to fix higher quantities than there is prospect of supplying. We are confident that the necessity of increasing the fresh vegetables for Indian troops and so obtaining a most important security against scurvy is fully realized and here again we would urge that the present allowance of 6 oz. should not be stereotyped any longer than is absolutely necessary.

83. *Tinned milk*.—All classes of tinned milk are grouped together for a uniform ration of 2 oz. irrespective of the milk being sweetened or unsweetened, of natural strength or condensed. We understand that the Indian has a marked preference for sweetened condensed milk and there would be advantage in indulging this preference as far as possible. The tins are, in our experience, distinctively labelled and the sweetened milk can readily be identified.

84. *Lime juice* has been cut out of the ration scale for the winter. It is somewhat difficult to advise about this substance. Lime juice is traditionally a well proved preventive of scurvy, but in Mesopotamia it has come to be considered of little value. The evidence on this point is by no means complete. On the one hand we have seldom or never found that it has been systematically issued and taken by the men. The 3rd Division were without lime juice for some 6 weeks in the summer, and the 14th Division, with negligible exceptions, for 9 weeks. Lime juice was sometimes given without the sugar which is necessary if it is to be willingly taken. On the other hand, the opinion is current, based apparently on a frequent nasty taste or forbidding appearance, that the material issued is often not lime juice at all, or is badly adulterated, and that in any case it is useless as an anti-scorbutic. Colonel Willcox, A. M. S., adopting this opinion advised in August that a “special” lime juice, made from fresh limes (with a little spirit of wine and salicylic acid to preserve it) should be prepared in India, and we understand this recommendation is being acted upon. But we think that more precise information should also be obtained in India as to the lime juice which has hitherto been supplied, and that the authorities concerned in India should be asked to enquire categorically into:—

- (a) the nature and terms of the specification to which the contractor or manufacturer is required to comply;
- (b) the method of control (analytical and other) over the quality of the lime juice submitted and accepted;
- (c) the liability of the lime juice to be spoilt by unsatisfactory casks or in transit;
- (d) the action taken on complaints or evidence of adulteration;

and at once to strengthen their requirements in these respects where necessary so that in future the lime juice, whether "special" or not, may be genuine and satisfactory. Given such a lime juice, we think it would be well to continue it in the Indian winter ration, and see to its being issued and taken under supervision. In British units the best results are got by preparing the lime juice drink at the cook-house and giving it out already diluted and sweetened; an adaptation of this method may be possible in Indian units.

85. *Tamarind or cocum*.—The ration scale of 2 oz. per man seems excessive, and we noticed large collections of tamarind being thrown into the incinerator. Probably $\frac{1}{2}$ or 1 oz. per man would supply all the tamarind or cocum tea he is likely to take. It was represented to us that good tamarind tea is made from tamarind under a year old, whereas the tamarind supplied to the troops is frequently three or four years old. We think it well to note the point for consideration, although we were not ourselves able to check the statement.

19. BACTERIOLOGICAL FACILITIES IN THE CORPS AREA.

86. *Laboratory barge*.—The laboratory barge which is to be regarded as a mobile unit for the Corps area and is at present stationed at Arab Village contains abundant working space and it is on the whole suitably equipped so far as the larger laboratory fixtures are concerned. Specimens for examination come from various parts of the Corps area but more especially from the field ambulances of the 7th Division which are located in the immediate vicinity of the barge. These ambulances at the present time are not working at high pressure and consequently it is possible to retain cases for somewhat longer periods than usual, before evacuation down river or return to the Corps. The opportunity therefore of securing bacteriological aid in the diagnosis of cases of enterica, dysentery, malaria, etc., has been largely taken advantage of by the field ambulances concerned.

87. Where a central laboratory, such as that now in question, has to supply the wants of ordinarily mobile units, it is most essential (1) that at each ambulance, an officer, preferably the Commanding Officer, should, in consultation with the bacteriologist, be responsible for the selection of cases for blood culture, agglutination tests, examination of excreta, etc., and the prompt despatch of samples in suitable outfits to the laboratory, and (2) that the laboratory personnel should be large enough to deal in the most expeditious manner with the material sent.

The development of rapid and accurate methods of diagnosis and of prompt issue of reports is of prime importance for the efficiency of a central laboratory of this kind.

88. Hitherto the personnel has consisted solely of the officer commanding the laboratory barge, Major Gloster, I.M.S., with the help of an imperfectly trained native laboratory servant. Much of Major Gloster's time has consequently been taken up in the supervision of media-making, sterilization, etc. A trained assistant bacteriologist, preferably British, has become urgently necessary, for, quite apart from possible illness, the officer commanding may at any time be required to leave the barge for a few days to investigate on the spot outbreaks of disease at some other part of the Corps area. A trained assistant would ensure that the important routine daily work would be duly carried on. A scale establishment for the laboratories generally has now been put forward. We are not sure whether this scale is sufficiently elastic to enable the additional British bacteriologist to be given to the laboratory barge; if not, we would recommend a special addition in this instance.

89. In our report on Basrah we urged that provision be made at once for securing a continuous supply of laboratory requisites to replace wastage. Until these arrive in Mesopotamia, this laboratory, like others similarly situated, will be somewhat hampered in its work, particularly owing to lack of suitable peptone and diagnostic sera.

The dearth of suitable outfits for samples of excreta from dysentery and enterica cases might be met in the meantime by asking all medical officers in the Corps area to make a special collection of cylindrical shaving soap tins

or kodak film tins. A gross of such receptacles would be of the utmost value at the barge, where they can be fitted with stoppers, etc., and re-distributed.

90. *Sheikh Saad laboratory*.—A large portion of the troops in the Corps area at present is evacuated from field ambulances to Sheikh Saad, and not by way of Arab Village. It is clear that the immediate establishment of a laboratory at Sheikh Saad, advocated in our report of 10th October, will be of the greatest value to this portion of the force. Not only will it serve the hospitals there, but it can act as a centre to which suspected material can quickly be sent by train from any point along the line, or from which the bacteriologist, in emergency, can reach places where swabs, blood tubes, etc., can best be obtained by himself on the spot.

91. *Work on the laboratory barge as to dysentery, etc.*—An examination by Lieutenant-Colonel Wenyon of dysenteric stools extending over a period of one week showed clearly that the bacillary infection is much commoner than the amœbic. This statement holds both for Indian and British troops. One case of balantidial dysentery was met with in an Indian.

Microscopic examination of the stools of thirty-one Indians, who were suffering from diarrhoea or dysentery, was made with the result that ten were cases of true dysentery and the remaining twenty-one appeared to be merely diarrhoea (possibly in some cases post-dysenteric). *Entamœba histolytica* was found in only one of the ten dysentery stools and *Balantidium coli* in another, the remainder being almost certainly cases of bacillary dysentery. Of the other twenty-one diarrhoeic cases, *trichomonas* was found in eight, *lamblia* in two, *Entamœba coli* in two and *Entamœba histolytica* (cysts) in two. Eggs of *ankylostoma*, though not specially looked for, were found in four. The stools of fourteen British were examined: four of these were dysenteric (evidently bacillary), the others simple diarrhoea. *Trichomonas* was found in three, *tetramitus* in one, *coccidium (isospora)* in one, *Entamœba coli* in three. In no case was undoubted *Entamœba histolytica* detected.

20. TELEGRAPHIC SUMMARY.

92. We append for convenience the following epitome of points in the report calling for notice in a telegraphic summary.

Medical Advisory Committee submitted full report on inspection 3rd Indian Army Corps—all three Divisions visited—summary of report as follows:—

1. *General sanitation*.—Arrangements and administration leave little to be desired. Work, Assistant Directors, Medical Services' and Sanitary Officers' efficient. Supervision and co-ordination of divisional sanitation and disease prevention by Corps Deputy Director, Medical Services (Sanitary), has been invaluable. To dislocate this work as result of re-arrangement forces at front would be disastrous. Committee has represented various details locally and in report. No summary of them necessary.

Following are urgently needed:—Iron water pipes, hose pipes, tarpaulins for water supplies; canvas repairers; assorted rubber, corks and spare parts for nascent chlorine apparatus; cresol, chlorinated lime and oil for disinfection; sufficient issue lamp oil for battalions; corrugated iron, wood, canvas and sacking for cook-houses, bake-houses, latrines and wash-houses; field cookers for British regiments and field ambulances; wire gauze for flies; iron bars for incinerators; serge clothing; stoves for field ambulances; more transport for (divisional) sanitary sections (Indian).

Remedy deficiencies sweeper personnel.

For next summer, ice and soda water plants and hot air fans essential.

Fly experts should be commissioned officers. Vermijelli advised as sand-fly repellent.

- (2) *Disease*.—Report reviews causes heavy sickness in Corps during 1916. Divisions now recovering from effects of past epidemics, heat and deficiencies in diet. Have actively eliminated sick and are receiving healthy drafts. Much greater health and energy resulting cooler weather and good sanitary work. Food received by British troops satisfactory. New British winter ration scale generous. Practically no British scurvy or beri-beri.

Corps experience is all against sending men direct from England to Mesopotamia in hot weather.

Now little epidemic disease except Indian scurvy. Diarrhoea, dysentery and enterica low. From July to October over 7,500 cases scurvy in Corps. Majority undoubted scurvy many severe. Results serious as all definite scurvy cases required evacuation India. Incidence general throughout force heaviest on division where greatest deficiencies food supplies and transport. Epidemic resulted primarily from continued diet very deficient in fresh meat and vegetables. Fuel often short. Other auxiliary causes indicated. Self-induced scurvy only a minor factor.

Active steps taken recently to detect early scurvy and improve diagnosis. Results satisfactory. Elimination early scurvy cases largely responsible recent high figures. Sharp fall set in and present position encouraging. Meat received Indian troops increased generally to 6 oz. daily during September and October and food supplies much more regular. Committee recommend series special observations on men recently joined to test effect new conditions of diet.

- (3) New Indian winter ration scale. Allowance of meat and fresh vegetables at 6 oz. each should not be stereotyped but increased when supplies permit. Gur should not be given as substitute for meat but daily allowance ordinary sugar in addition to gur in great request and recommended. Tamarind allowance excessive. Preference of Indians for sweetened condensed milk should be met if possible. Questions of quality ghi, lime juice, etc., noted for any necessary communication India. If genuine lime juice procurable lime juice should be restored to Indian winter ration.
- (4) Laboratories. Additional British bacteriologist required laboratory barge. Laboratory at Sheikh Saad should be expedited.

21. ACKNOWLEDGMENTS.

93. In addition to the officers mentioned in the body of the report, and to whom we are much indebted for help and information, we would express our obligations to Major Harvey, I. M. S., D. A. D., M. S. (Corps); to Colonel Wimberley, I. M. S., and Major Horton, D. S. O., I. M. S., respectively A. D., M. S., and D. A. D., M. S., 14th Division; and to Captain MacGregor, D. A. D., M. S. (Sanitary), 7th Division. To the officers of the various field ambulances visited, our thanks are also due both for their assistance in our enquiries and their kind hospitality.

We have the honour to be,

SIR,

Your obedient servants,

ANDREW BALFOUR, LIEUT.-COLONEL,

R. A. M. C.

G. S. BUCHANAN, LIEUT.-COLONEL,

R. A. M. C.

J. C. G. LEDINGHAM, LIEUT.-COLONEL,

R. A. M. C.

C. M. WENYON, LIEUT.-COLONEL,

R. A. M. C.

The 5th November 1916.

Appendix No. 1.

PROGRAMME OF WAR OFFICE MEDICAL ADVISORY COMMITTEE IN 3RD INDIAN ARMY CORPS.

October 11th	.	.	.	War Office Committee arrived at Corps Headquarters, Colonel Ledingham billeted with 130 I. F. A. to be near laboratory barge.
„ 12th	.	.	.	Cavalry Brigade and Ambulances. 7th Division supply depôt. Central disinfecting station. Camps on right bank. Arab Village below bridge. Laboratory barge.
„ 13th	.	.	.	Central area, 7th Division.
„ 14th	.	.	.	Corps Headquarter Camp. Back area of 7th Division, with Stokes Motor Brigade and ambulances, also Divisional Headquarters.
„ 15th	.	.	.	Sannaiyet trenches. Office records.
„ 16th	.	.	.	Halt. Office work.
„ 17th	.	.	.	3rd Division. Narrows Camp with Abu Roman and water installations.
„ 18th	.	.	.	Twin Canals camp also Higland Nullah Camp (3rd Division, 7th Brigade). Blook House 31. Water supply.
„ 19th	.	.	.	Halt.
„ 20th	.	.	.	Commander-in-Chief's visit. Committee interviewed at Twin Canals. Interviews.
„ 21st	.	.	.	Proceed to Ess Sinn. 8th Brigade, 3rd Division, at Sinn Abtar camp.
„ 22nd	.	.	.	Wagon lines of batteries near Nasafieh chlorinating station. Nasafieh chlorinating station. Field ambulances (Nos. 1, 20, 21, 22).
„ 23rd	.	.	.	Imam-el-Mansour 1-5th Buffs. 1-2nd Gurkhas. 3rd Brahmins. 128th Pioneers.
„ 24th	.	.	.	Pentagon 82nd Punjabis. Megasis water supply. 82nd Punjabis. 1-4th Hants.
„ 25th	.	.	.	Dujailah Supply and Transport Depôt. 2-4th Gurkhas. Ordnance depôt and station.
„ 26th	.	.	.	Sapper and Miner Field Companies. 1-4th Devons. 45th Sikhs. Butchery and Bakery.
„ 27th	.	.	□	Return to Corps Headquarters from Ess Sinn.

Appendix No. 2.**DIAGRAM SHOWING ORGANIZATION OF No. XI SANITARY SECTION,
III DIVISION.**

VII Brigade. 1 British non-commissioned officer. 7 sweepers for general duty and general tidiness of Brigade.	VIII Brigade. 1 British non-commissioned officer. 7 sweepers.	IX Brigade. 1 British non-commissioned officer. 7 sweepers.
VII Brigade—Water. 4 sepoys. 1 sweeper.	III Division—Headquarters. 1 British non-commissioned officer. 6 sweepers.	Twin Canals—Water. 1 sweeper.

SHEIKH SAAD.	ARAB VILLAGE.		TWIN CANALS.		BLOCK HOUSES.
III Division Depôt.	Rest Camp.	Convalescent Camp.	Rest Camp.	Convoy Ground.	M. L. R.
1 Naik.	...	...	...	...	...
3 sweepers.	2 sweepers.	2 sweepers.	2 sweepers.	2 sweepers.	2 sweepers.

TOTAL.		HEADQUARTER NO. XI SANITARY SECTION.	
Officer	1	Officer Commanding section.	
British non-commissioned officers	9	5 British non-commissioned officers.	
Indian non-commissioned officers	3	2 Indian non-commissioned officers.	
Sepoys	7	3 sepoys.	
Bhistis	5	5 bhistis.	
Bildars	7	7 bildars.	
Driver	1	17 sweepers.	
Sweepers	59	1 driver.	
Pony	1	1 pony.	
Mules	4	1 G. S. wagon.	
G. S. wagon	1	4 mules.	

ARRANGEMENT OF HEADQUARTER MEN OF SECTION.

Non-commissioned officers in charge—1 British Sergeant.
Office—1 British non-commissioned officer.
Stores—1 British non-commissioned officer, 1 sweeper.
Carpenter 1 sweeper.
Cook 1 sweeper.
Line sweeper 1 sweeper.
Building squad—1 British non-commissioned officer, 4 sweepers.
General duty squad—1 British non-commissioned officer, 6 bildars, 9 sweepers.
Horses, harness, etc.—1 driver (Royal Artillery), 1 bildar.
Water duties—5 bhistis.
Guards, etc.—2 Indian non-commissioned officers, 3 sepoys.

Appendix No. 3.

INDIAN WINTER RATION SCALE.

Extract from General Routine Orders of 31st October 1916.

RATIONS.

The following will be the scale of rations in future :—

*	*	*	*	*	*	*	*	*
INDIAN TROOPS.								
								lbs. ozs.
<i>Daily.</i>								
1	Atta or rice	.	.	.	.	.	.	1 8
2	Fresh meat	.	.	.	.	.	.	6
	(Gur when fresh meat not available)	.	.	.	.	.	.	2
3	Dhall	.	.	.	.	.	.	4
4	Gur	.	.	.	.	.	.	2
5	Ghi	.	.	.	.	.	.	2
6	Potatoes or fresh vegetables	.	.	.	.	.	.	6
	(Dried vegetables when fresh not available.)	.	.	.	.	.	.	
7	Fresh fruit (tinned fruit 2 oz. or dried fruit 1 oz. when fresh fruit not available).	.	.	.	.	.	.	2
8	Tea	.	.	.	.	.	.	$\frac{1}{4}$
9	Milk, tinned	.	.	.	.	.	.	2
10	Condiments (ginger, chillies, garlic, turmeric)	.	.	.	.	.	.	$\frac{3}{4}$
11	Salt	.	.	.	.	.	.	$\frac{1}{4}$
12	Tamarind or cocum	.	.	.	.	.	.	2
13	Fuel (wood)	.	.	.	.	.	.	2 0
<i>Thrice weekly.</i>								
14	Ghi (Mondays, Wednesdays and Fridays)	.	.	.	.	.	.	2
15	Lime Juice (Tuesdays, Thursdays and Saturdays)	.	.	.	.	.	.	$\frac{1}{4}$
							(Not in winter).	
<i>Weekly.</i>								
16	Sundays	{	Tobacco	.	.	.	.	2
			Cigarettes	.	.	.	.	No. 40
			Sweets	.	.	.	.	4
17	Matches	.	.	.	.	.	.	2 boxes

NOTE.—Supply officers will always keep a supply of rum during the winter season. Its issue will be limited to winter season and then only when specially sanctioned by divisional or higher commander.

Summer season—1st April to 31st October.

Winter season—1st November to 31st March.

INDIAN TROOPS—OPERATION SCALE.

									lbs. ozs.
1	Atta or rice	.	.	.	.	.	.	.	1 4
2	Fresh meat	.	.	.	.	.	.	.	4
	(Gur when fresh meat not available)	.	.	.	.	.	.	.	2
3	Dhall	.	.	.	.	.	.	.	4
4	Ghi	.	.	.	.	.	.	.	2
5	Gur	.	.	.	.	.	.	.	1
6	Potatoes or fresh vegetables	.	.	.	.	.	.	.	2
7	Tea	.	.	.	.	.	.	.	$\frac{1}{4}$
8	Condiments (ginger, chillies, turmeric and garlic)	.	.	.	.	.	.	.	...
9	Salt	.	.	.	.	.	.	.	$\frac{1}{4}$
10	Fuel	.	.	.	.	.	.	.	1 0

NOTE.—This scale will be issued only on special occasions when there is a need for transport to be limited.

